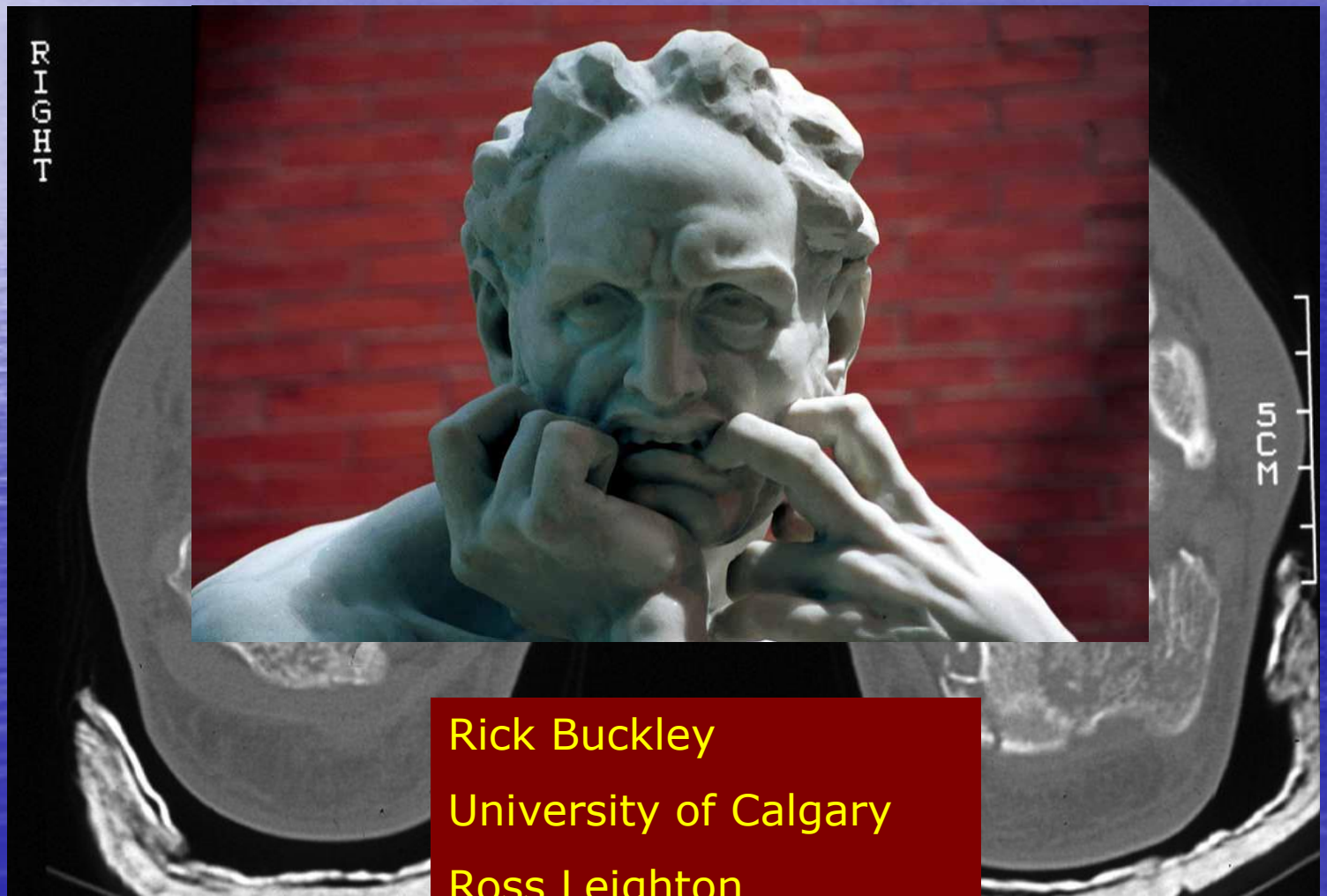
The Calcaneal Fracture – Who to operate on ?



Rick Buckley

University of Calgary

Ross Leighton

Clinical Problems

- Stiffness
- Loss of normal gait
- Shoe wear problems
- Arthritic pain
- Peroneal pain
- Heel pad pain

Classifications

- Several used- None are ideal
- Most commonly used
  - Essex-Lopresti
  - Sanders

Non-op Treatment: Complications

Can lead in some cases to Malunion

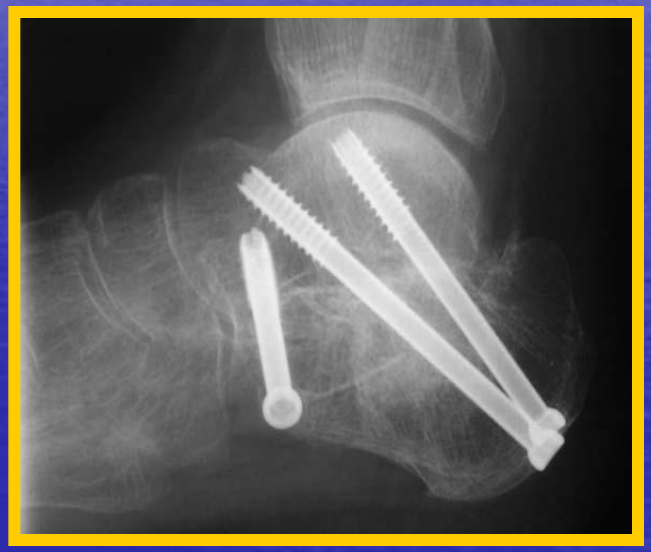
- Varus hindfoot
  - — Locks midfoot
  - — Medializes "foundation" for stance
- Shortened foot = short lever arm
- Peroneal impingement/ dislocation
- Shoe wear problems

Non-op Treatment:

Injury

Non-op Treatment: Complications

- Malunion treatment
  - Orthosis/ custom shoe
  - Lateral wall exostectomy
  - Peroneal tenodesis
  - Subtalar fusion +/- bone block
  - Sliding wedge osteotomy



Non-op Treatment: Complications

- Stiffness
  - Prevention (early ROM)
  - Therapy
- Subtalar arthritis
  - NSAIDs
  - Subtalar fusion

Operative Treatment: Natural History

- Initial results were poor (wound problems)
- Modern ORIF techniques improved results
  - Anatomic reduction for good result
  - Fracture severity correlates with results
  - Learning curve
  - Mini invasive –better for the soft tissues ?? As good a reduction
  - Unknown for all types

Operative Treatment: Rationale

- Restore anatomy
  - Shape and alignment of hindfoot
  - Articular congruency
- Return to function & prevent arthritis
- Typically, restoring articular anatomy gives improved results if complications are avoided
- Chondral apoptosis can ruin a nice reduction!!

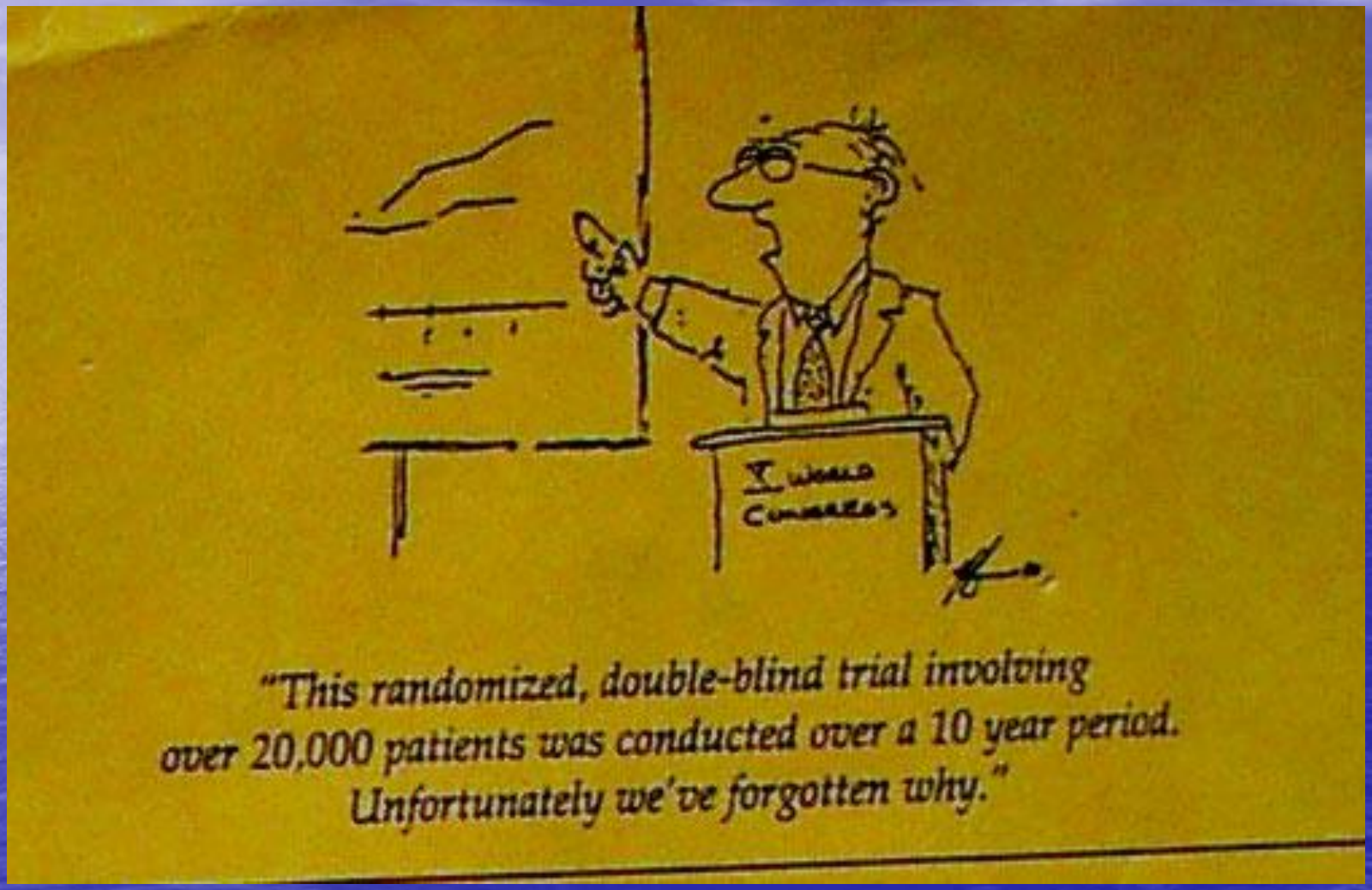
Operative vs. Non-op Treatment

- Orthopedic literature is lacking
- Buckley et al—one of the few prospective, randomized studies with long term follow-up

Operative Compared with Nonoperative Treatment of Displaced Intra-Articular Calcaneal Fractures
A Prospective, Randomized, Controlled Multicenter Trial

Richard Buckley, MD, FRCSC, Suzanne Tough, PhD, Robert McCormack, MD, FRCSC, Graham Pate, MD, FRCSC, Ross Leighton, MD, FRCSC, Dave Petrie, MD, FRCSC and Robert Galpin, MD, FRCSC

PRCT



Buckley et.al. JBJS (A) 2002 PRCT - DIACF

Buckley et al

- Between April 1991 and December 1997, 512 patients with a calcaneal fracture were treated. Of those patients, 424 with 471 displaced intra-articular calcaneal fractures were enrolled in the study. Three hundred and nine patients (73%) were followed and assessed for a minimum of two years and a maximum of eight years of follow-up.
- **This is unlikely to be repeated !!!**

Buckley et al

- after unmasking the data by removal of the patients who were receiving Workers' Compensation, (WCB in Canada)(Litigious patients in the USA) the outcomes were significantly better in some groups of surgically treated patients.

Operative vs. Non-op Treatment

Thodarson and Krueger, F&A,

- Matched set of op and non-op treatment
- Modern operative technique
- AOFAS scores: Operative= 86.7
  Non-op= 55

"Operative treatment successful and preferable unless contraindications present"

What We Know!!
Operative Treatment:
"Contraindications"

- Most are relative but combined they are absolute
- Diabetes
- Vascular insufficiency
- Smoker
- Severe swelling
- Open fractures
- Sanders type IV (very comminuted)
- Elderly
- Neuropathic
- Non-compliant pt.
- In-experienced surgeon

Operative Treatment: Contraindications

Folk et al., JOT, 1999

- Diabetes
- Vascular insufficiency
- Smoker

Wound problems: these factors have logarithmic effects. If all 3, >90%.

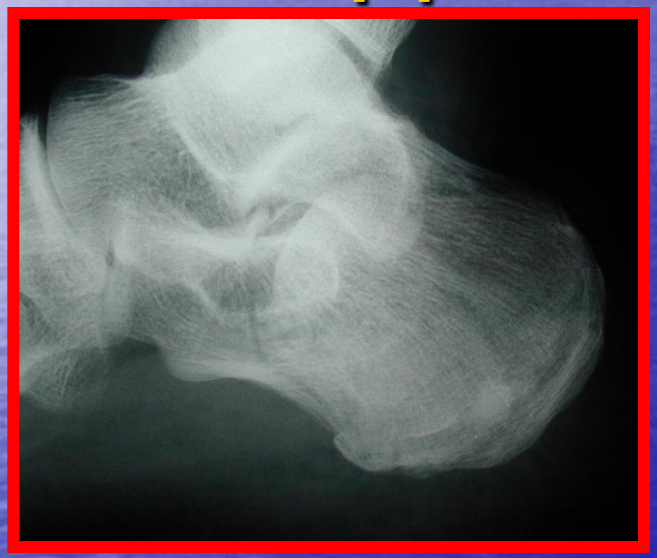
Operative Treatment:

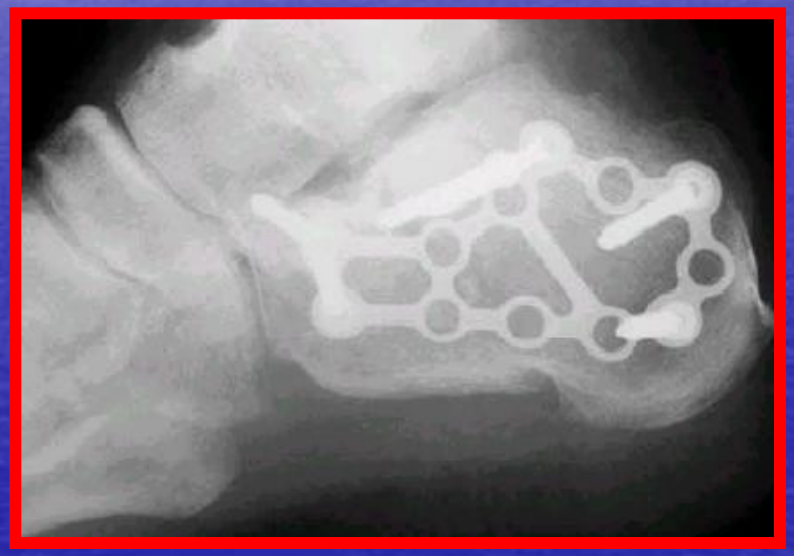
- Open Fracture Recommendations
  - ORIF?: Medial grade I open fx
  - Internal Fixation or external fixation for all lateral wounds and grade III medial open fx--- ext fix or pins
  - Percutaneous methods?

Treatment: A Rational Approach?

- Many treatment methods attempted
- "Best" method remains controversial
- Assess each case individually
  - Injury/ patient/ surgeon
  - Risks vs. benefits

ORIF with soft tissue sparring approach versus Extensile Lateral Approach





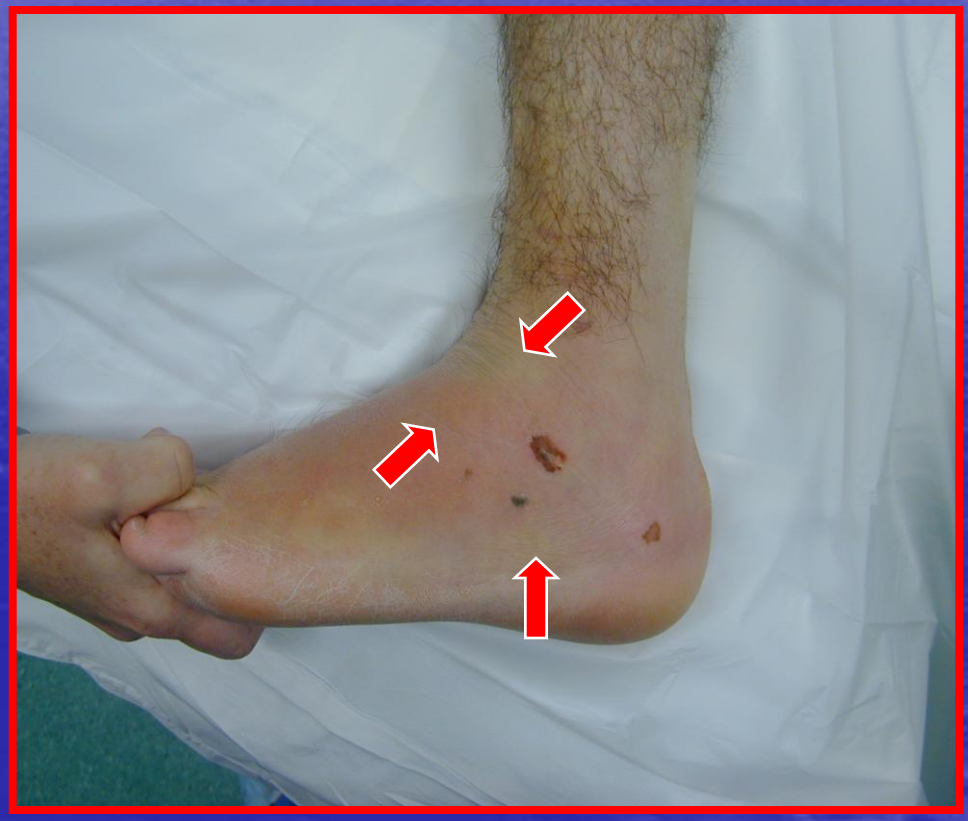
Benirschke/Sangeorzan, Clin Orthop, 292: 128-134, 1993

Letournel, Clin Orthop, 290: 60-67, 1993

Sanders et al., Clin Orthop, 290, 87-95, 1993

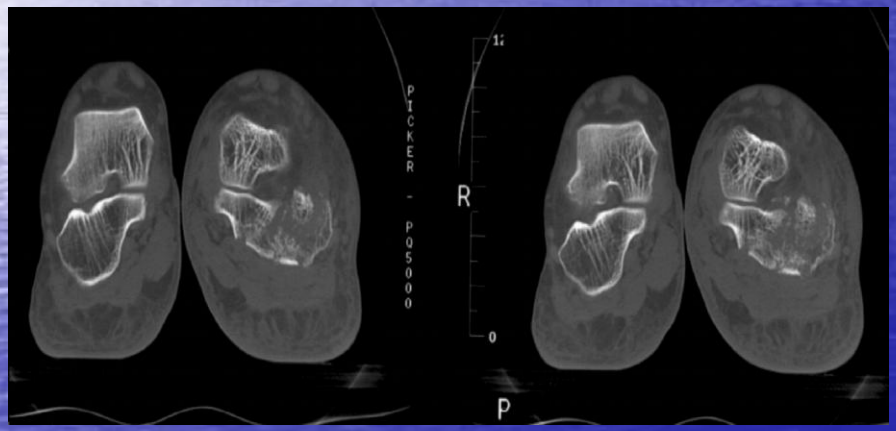
ORIF: Pre-op

- Elevation
- Compression stocking
- Cast boot
- ORIF @ 10-14 days
- + Wrinkle test



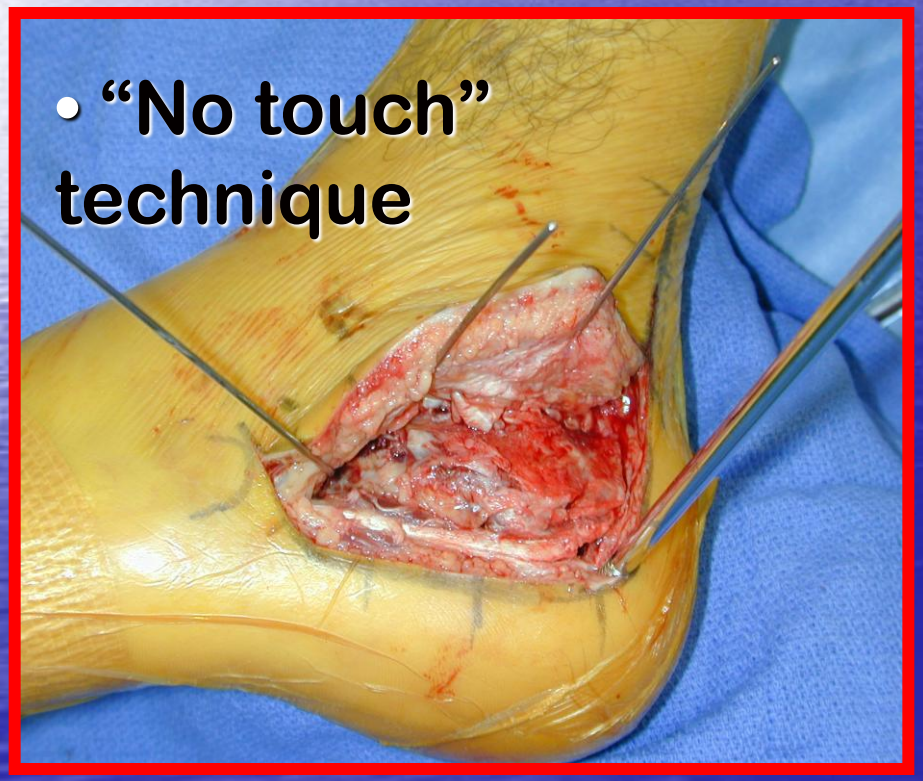
Lateral and axillary view

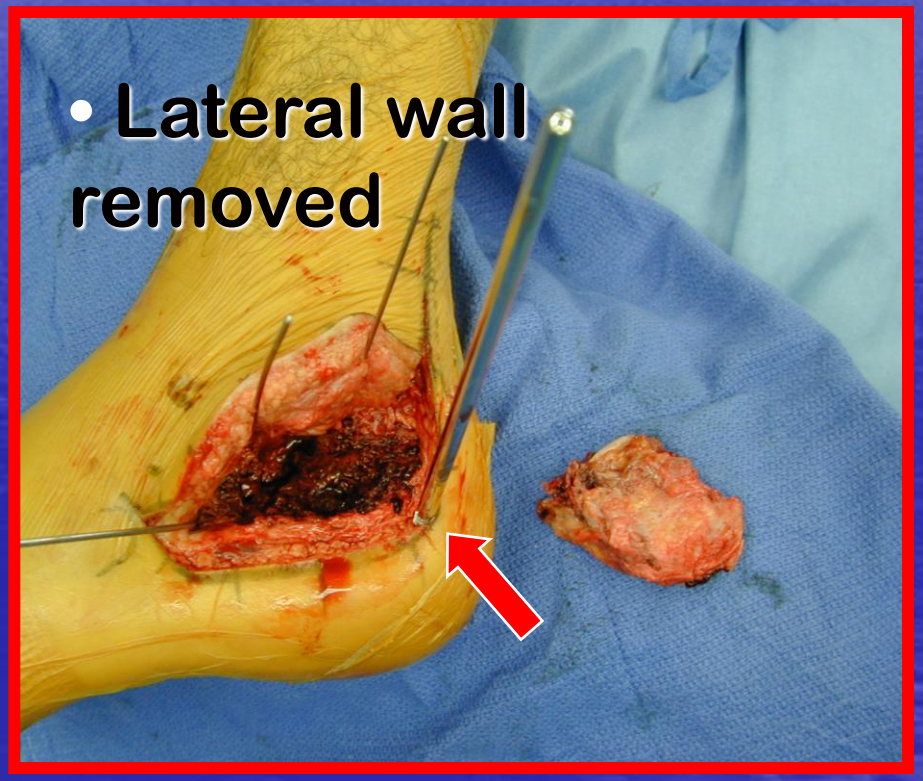
CT—indicating fracture lines and fragments



ORIF via a lateral approach

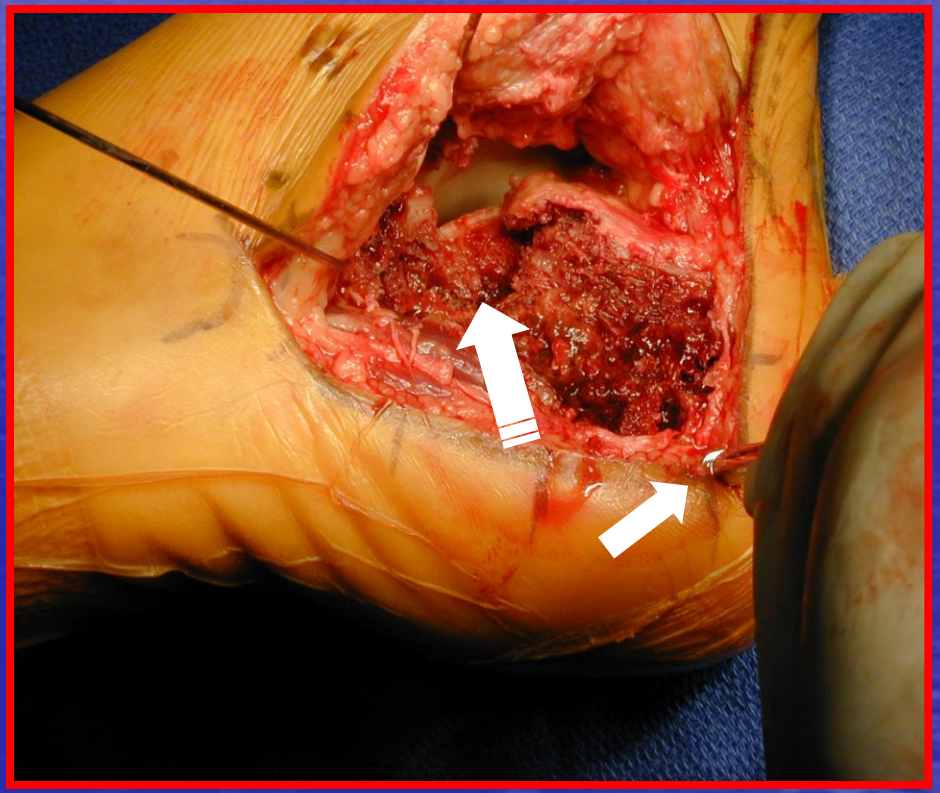
ORIF: Lateral Approach





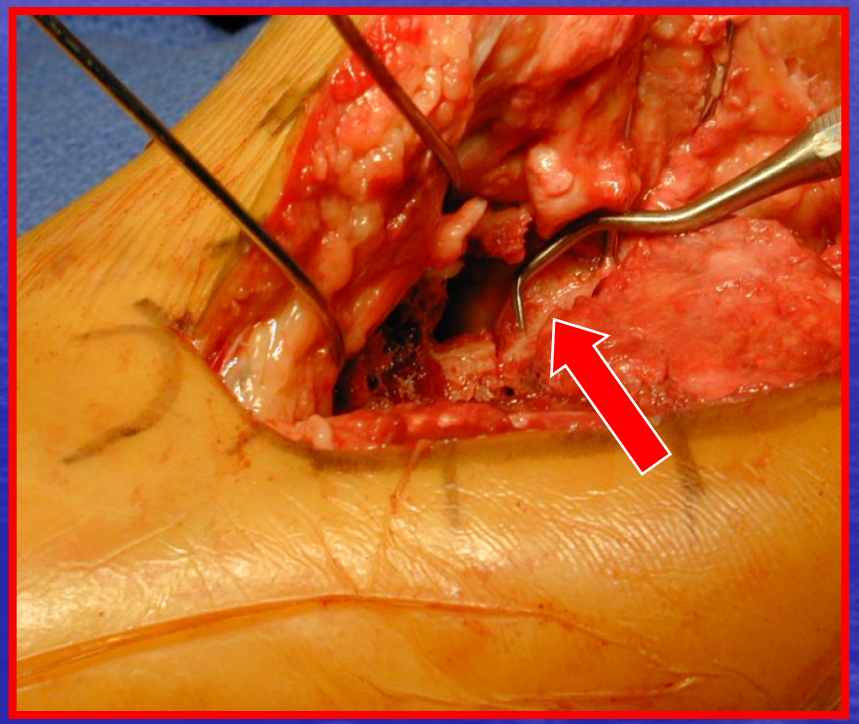
ORIF: Lateral Approach

- Schanz pin to manipulate tuberosity
- Clean out fracture
- Disimpact sustentacular fragment



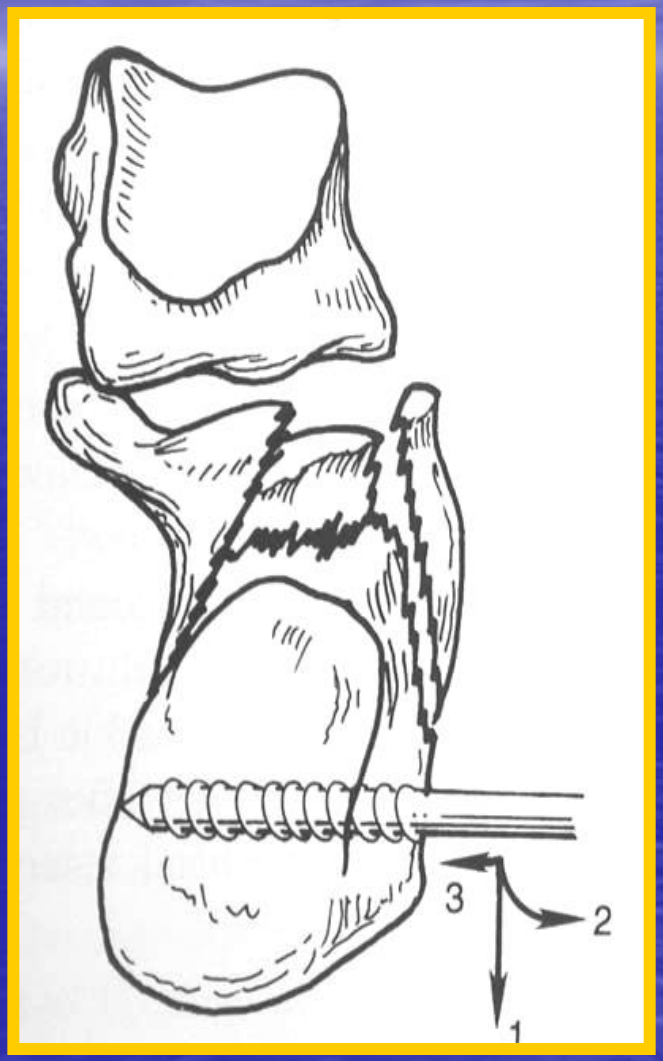
ORIF: Lateral Approach

- Reduce post. facet fragments if comm.
- K-wires/ absorbable pins
- Reduce post. facet to sustentaculum- ant. process

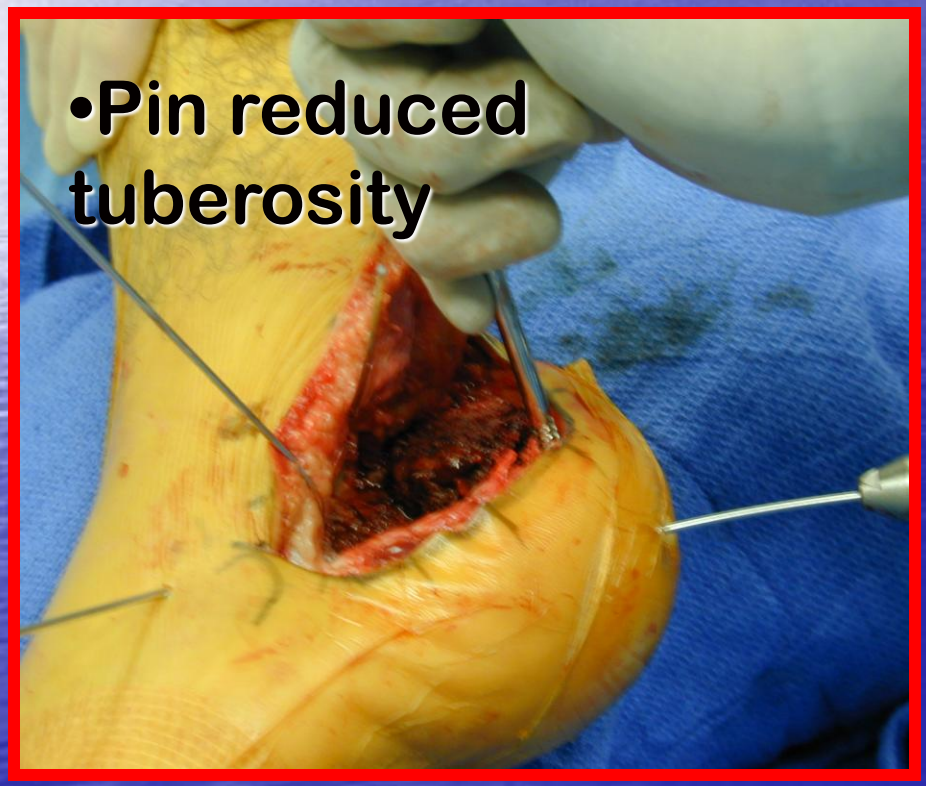


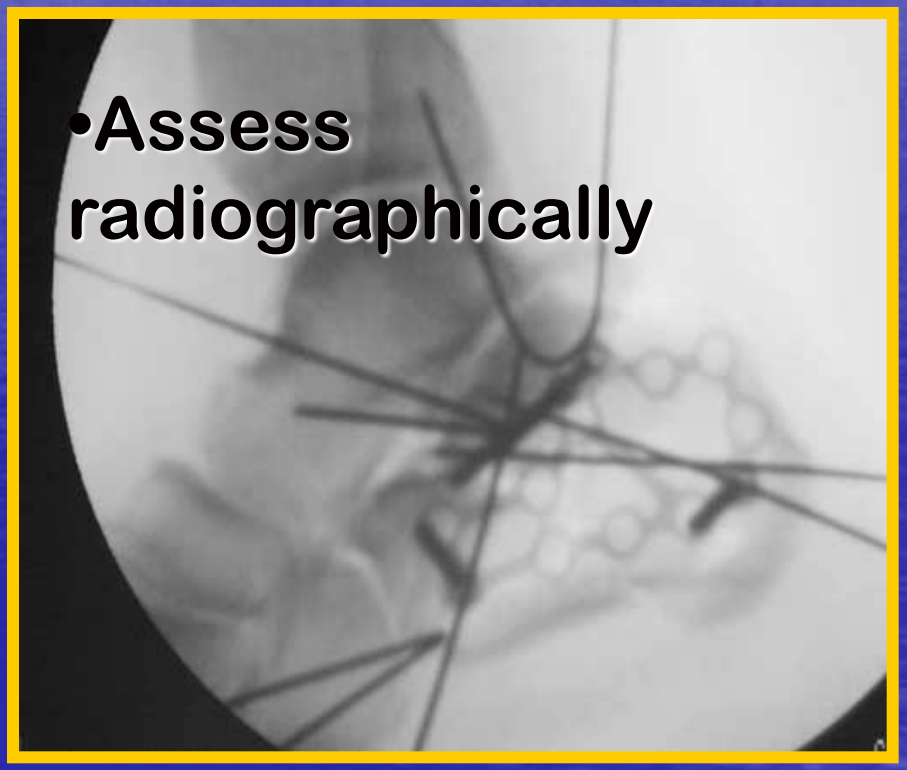
ORIF: Lateral Approach

- Reduce tuberosity fragment to sustentacular complex
  1. Restore height
  2. Restore valgus
  3. Medial translation



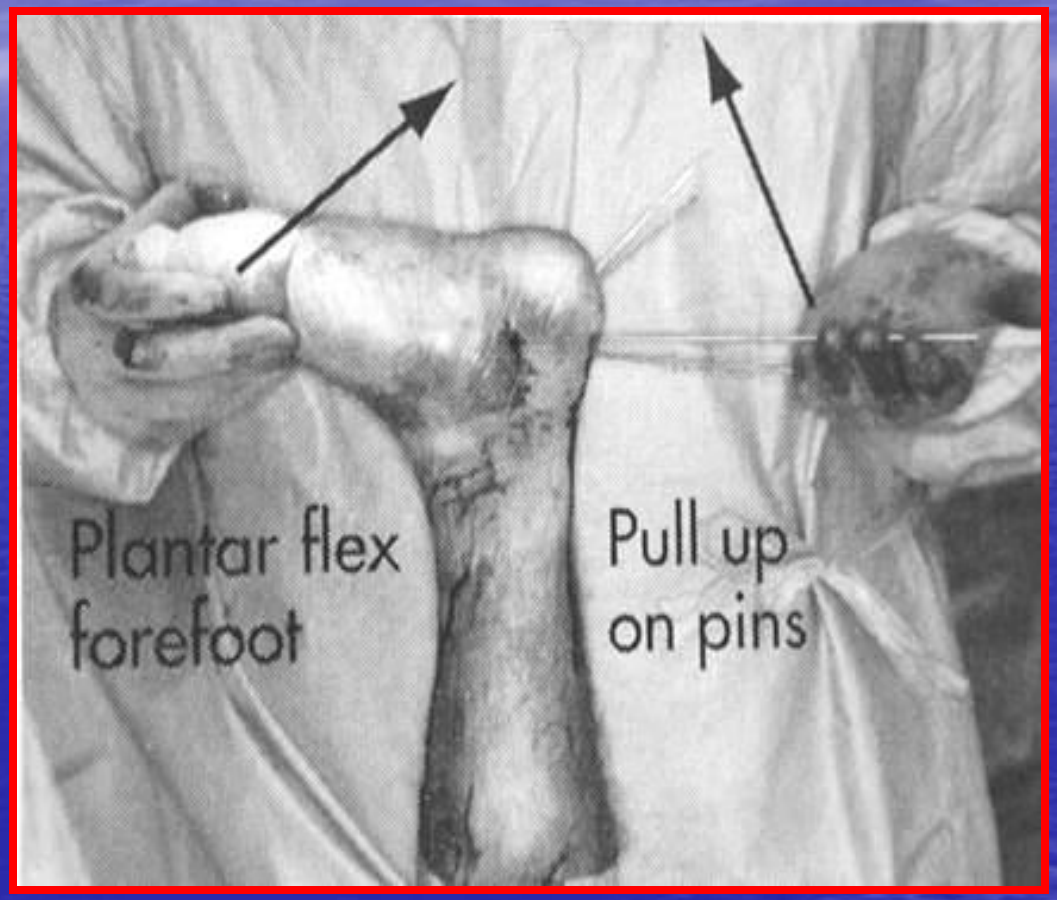
ORIF: Lateral Approach





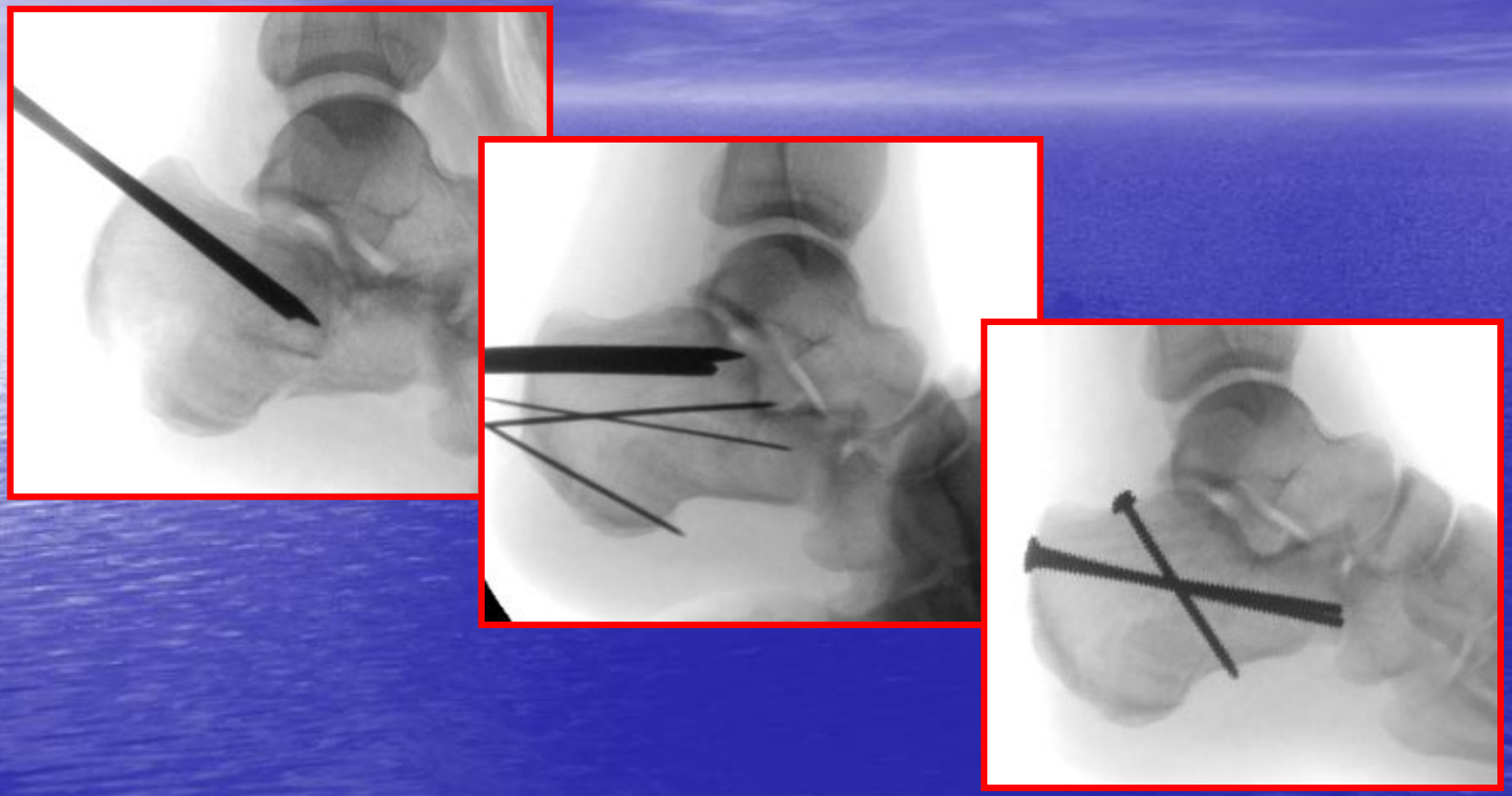
Surgery: Percutaneous I

- Essex-Lopresti maneuver
- Tongue type fractures



Essex-Lopresti, Clin Orthop, 290: 3-16, 1993

Surgery: Percutaneous I



Essex-Lopresti, Clin Orthop, 290: 3-16, 1993

Operative Treatment: Complications

- All those of non-operative care….
  - —Malunion
  - —Stiffness
  - —Subtalar arthritis
  - —Peroneal tendons
  - —Sural nerve pain
  - —Heel pad problems, plus…

PLUS____Operative Treatment: Complications

Wound problems

- Apical wound necrosis
  - Stop ROM
  - Leave sutures in
- Infection
  - Antibiotics
  - I&D
  - Soft tissue coverage?

Calcaneus, ORIF, Is There an Advantage??

YES

---Sanders I-III in selected patients

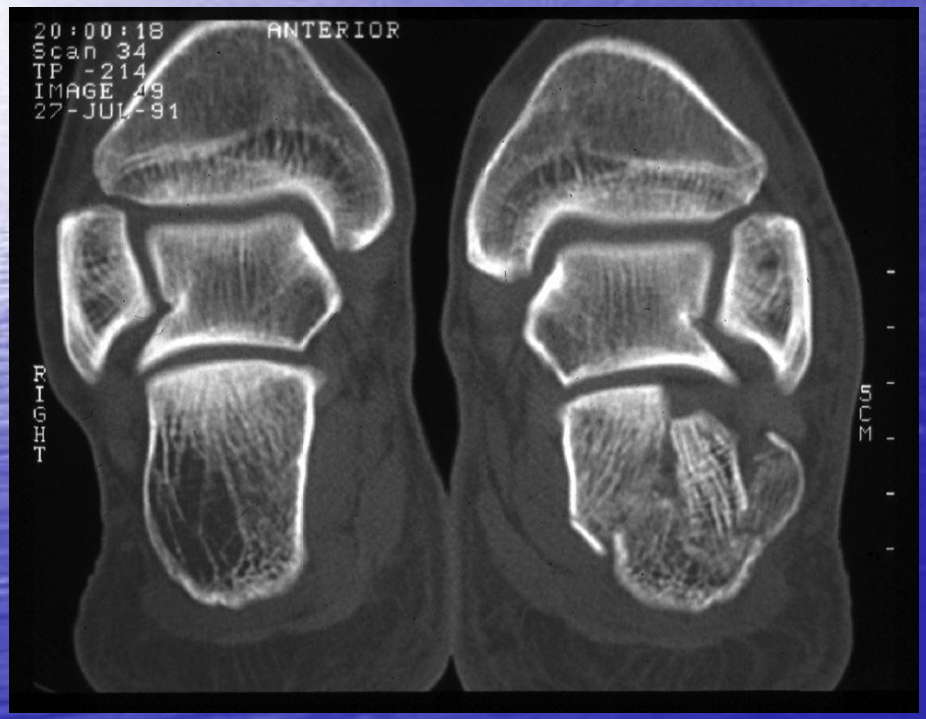
Ross Leighton M.D.PhD.

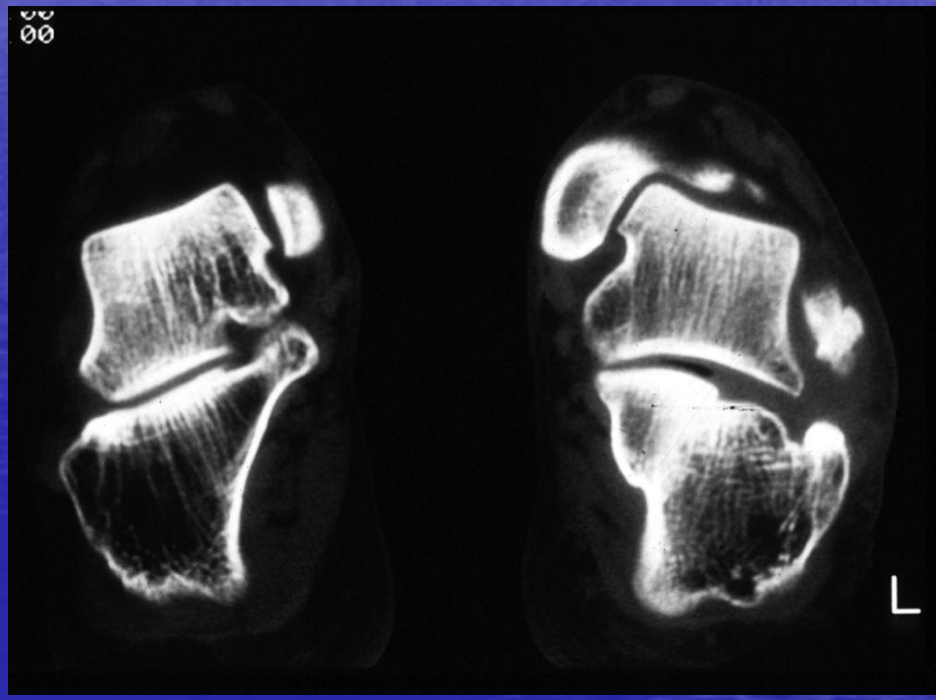
Fun Fracture !!

Some Truths

- This population is a very special sub-group
- Poor decision makers with few resources
- Smoke and drink heavily

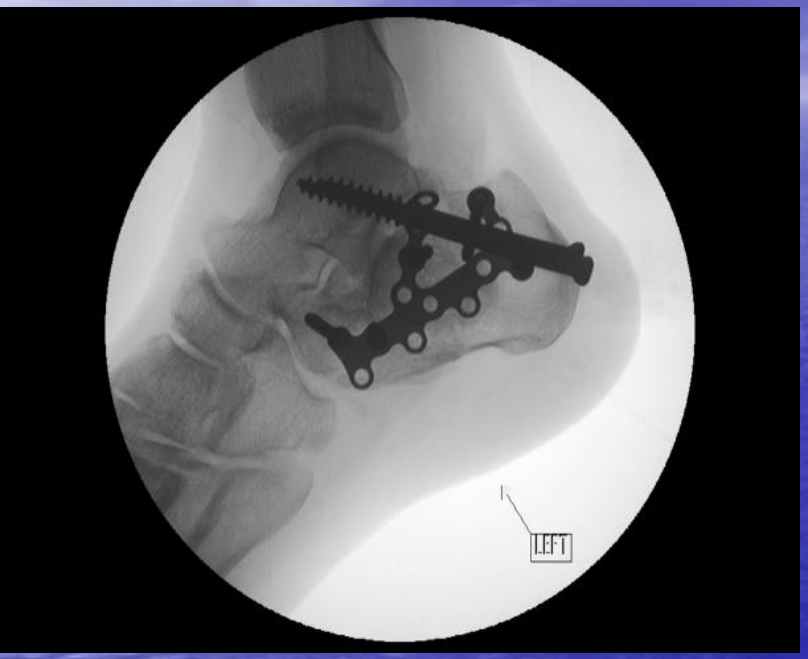
Non-Operative Care Can be successful





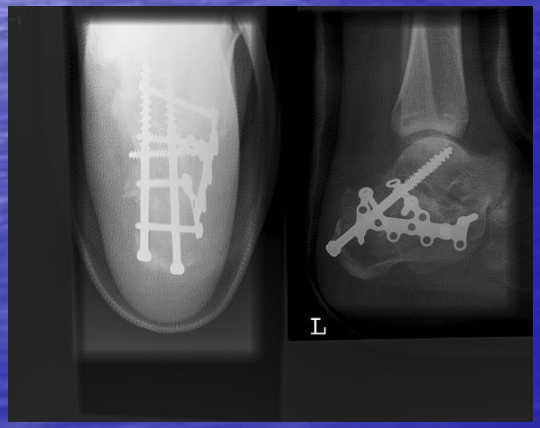
Non-Operative Care

Fusions



- Fusion is a good late reconstructive option (Csizy,Buckley 2002 JOT)
- 1 in 6 patients treated with nonop care will need a fusion; 1 in 40 tx ORIF
- The results of late fusion are equivalent to an average result following early ORIF – 7/10
- Not a bad salvage but not as good a an excellent ORIF

Who to Primarily Fuse ?



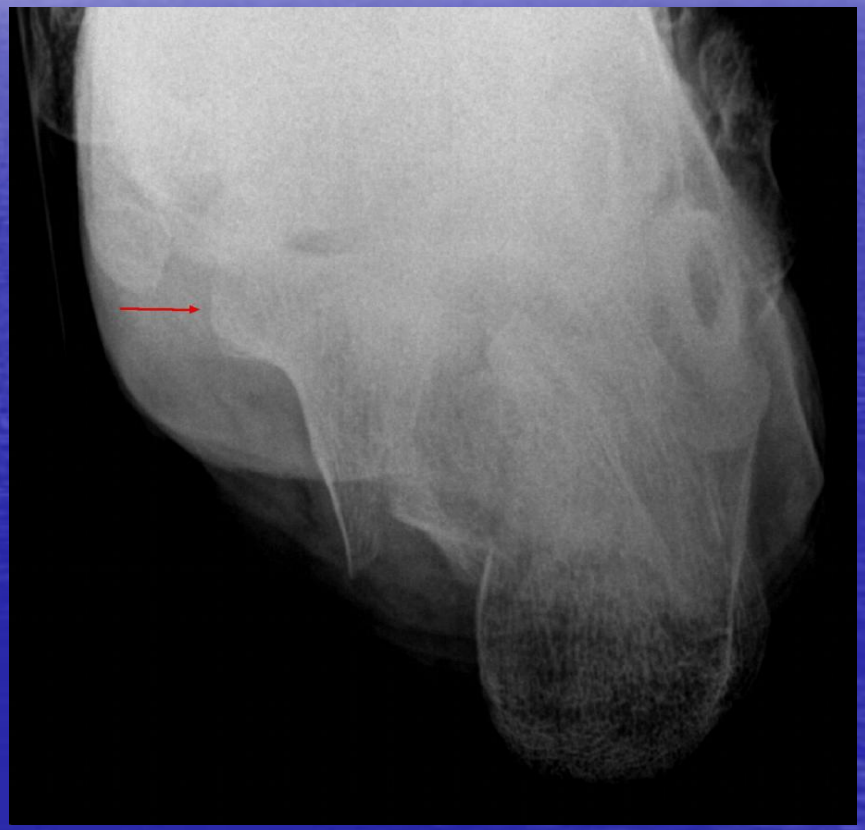
- OTA grant – RCT in Canada – 2004 (5 year study)
- Sanders 4 – either

  ORIF or Fuse

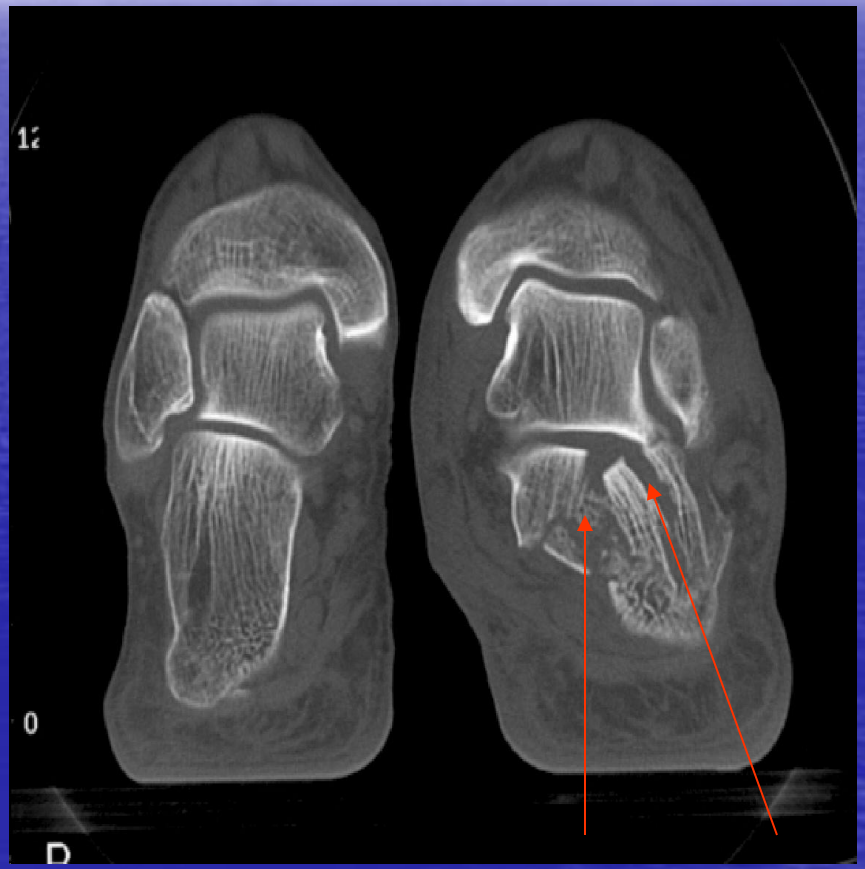
  Leighton and Buckley
- Results ?
- The results are not 100% of course as it was not adequately powered but the trend is towards primary fusion of Sanders IV

40 y o male fell off ladder and landed on right heel

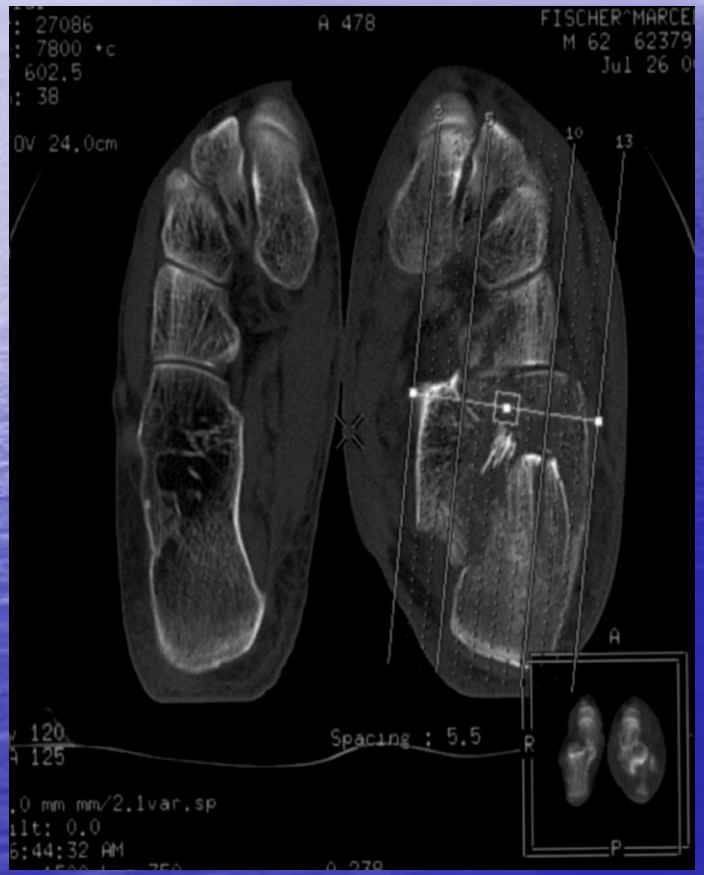
Lateral and axillary view



Investigations:--3 pieces of os calcis indicating Sanders III

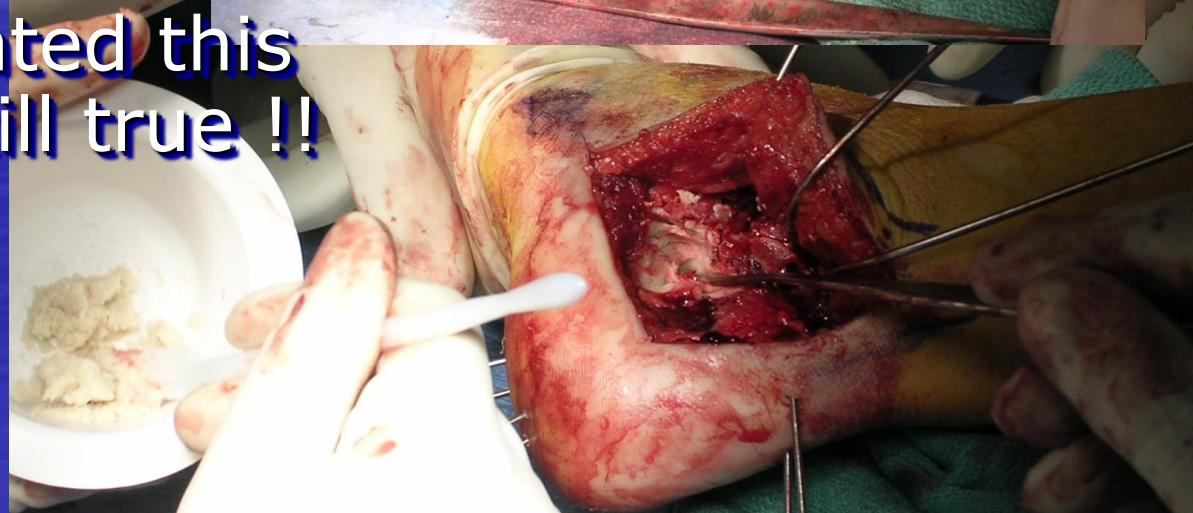


Treatment ??
When?, Approach??
Bone Graft??



e "Defect"

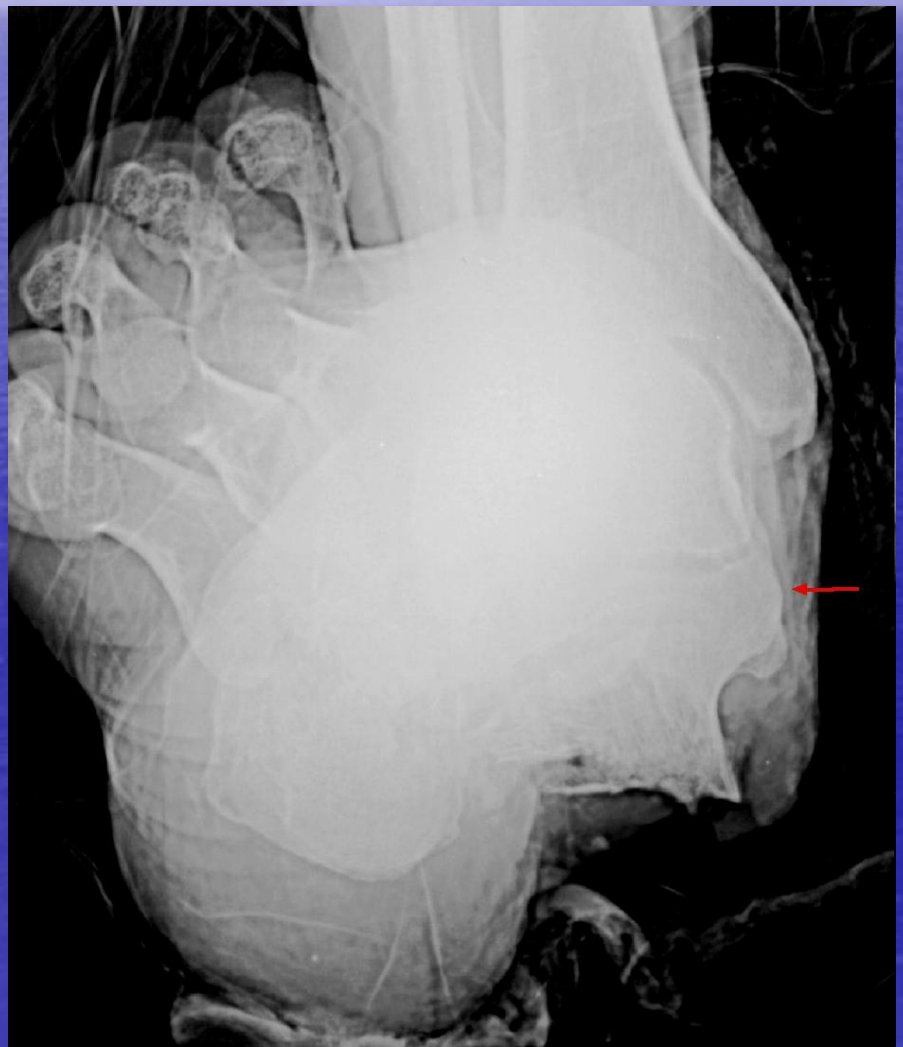
- Bone graft is not helpful (Longino 2001 JOT)
- Bohler's angle drops an average of 7 degrees with the use of bone graft
- Use nothing to add to the space in most patients
- LeTournel advocated this 25 years ago –still true !!



ORIF via a lateral approach

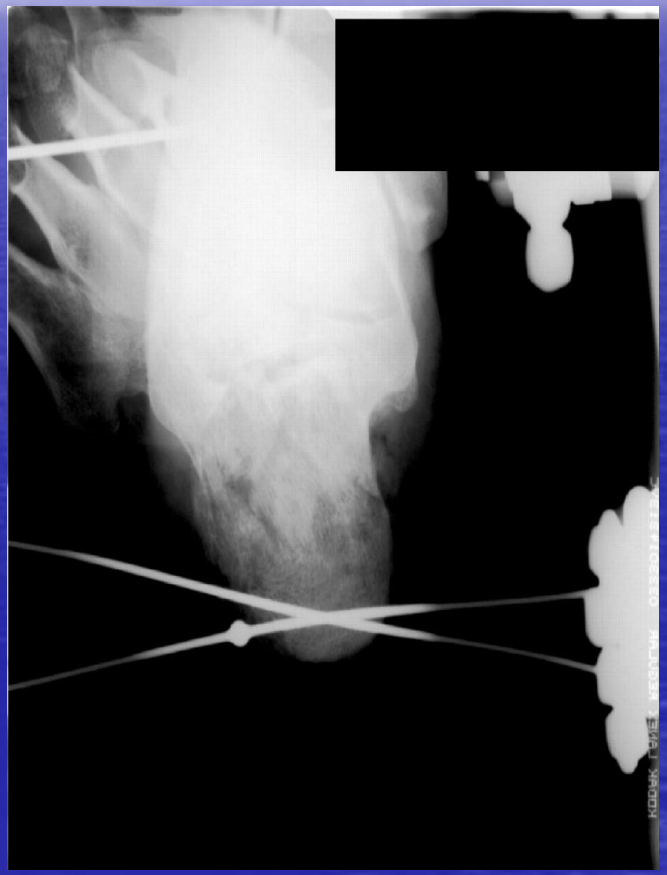
25 Y O Male with large 6 cm transverse medial compound Os calcis fracture

Deformed with medial compounding

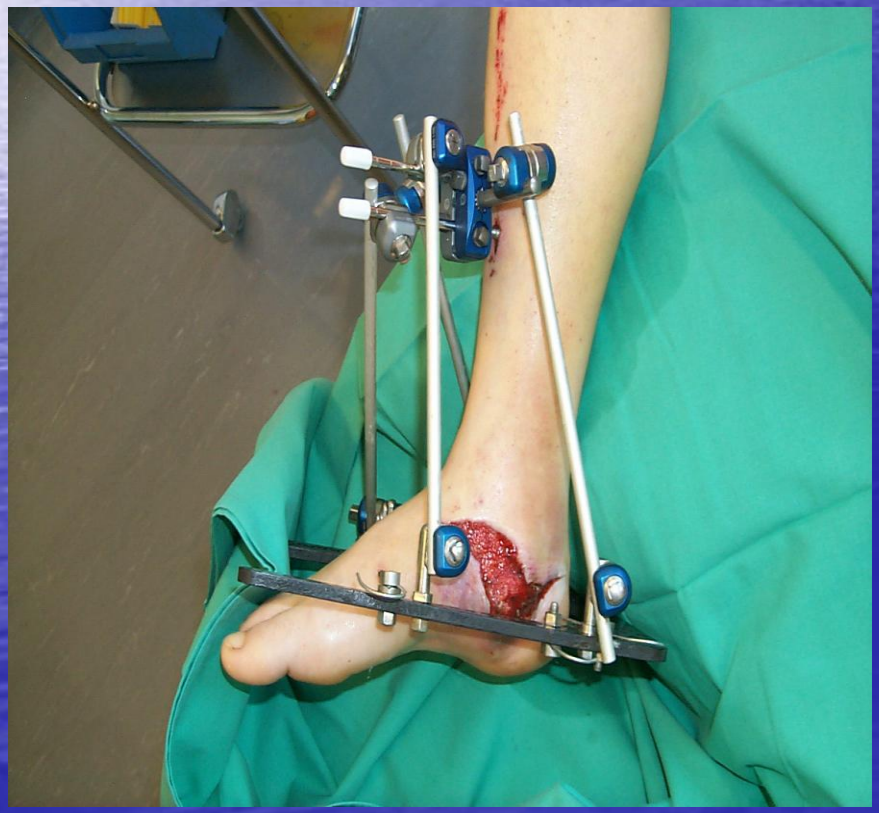


Compound Fracture of the Os Calcis- after closed manipulation

Treatment



Definitive fixation deferred until soft tissues are determined to be acceptable (may never be acceptable)



External Fixator

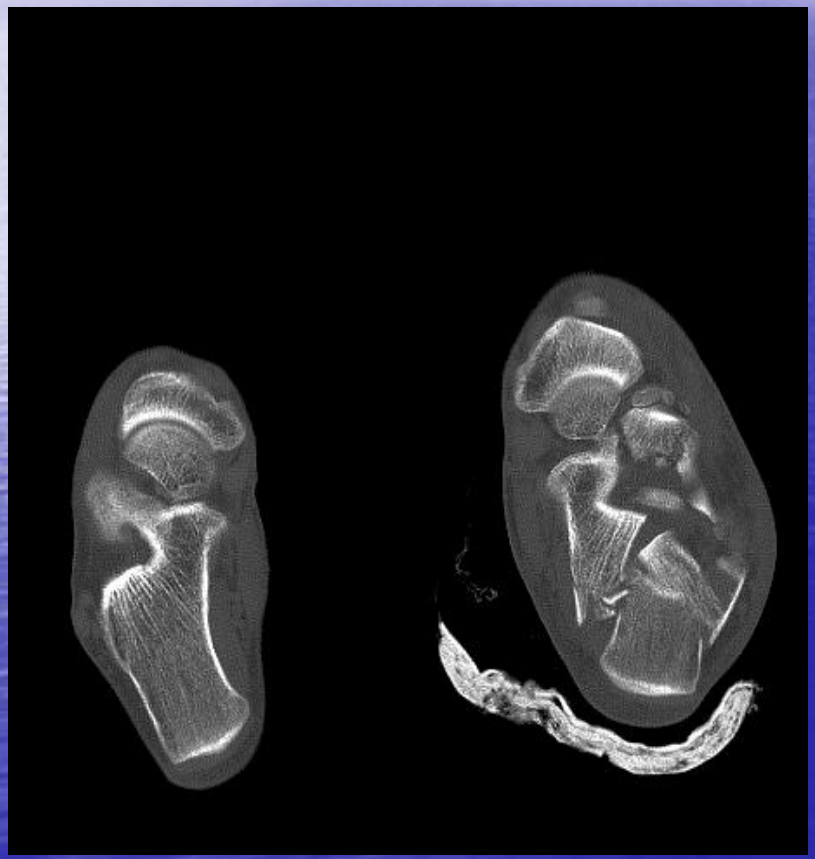
- Minimally invasive
- Indirect reduction
- Learning curve
- Immediate weight bearing as tolerated

Paley and Fischgrund,

What We Know!!
Operative Treatment: Contraindications

- Diabetes
- Vascular insufficiency
- Smoker
- Severe swelling
- Open fractures
- Sanders type IV (very comminuted)
- Elderly
- Neuropathic
- Non-compliant pt.
- In-experienced surgeon

Nonoperative Treatment does not equal NO TX !!



- Older patient
- Smoker, noncompliant
- WCB ; extra-articular#
- Litigious patient-post MVA
- Heavy laborer
- Medically unwell
- Bilateral ?
- Fusion can salvage !!
- Sanders IV—1 fusion??

What We Know!!
Operative Treatment: works best in??

- Sanders I

to Sanders III

- Do not perform until the soft tissue is ready for your proposed approach
- Mini –invasive (medial or lateral) can be performed earlier than extensile approach
- Keep them non weight bearing until the soft tissues are solidly healed at 6 weeks
- ORIF plus subtalar fusion for Sanders IV

THANK YOU

Halifax Waterfront

Capital Health District
Orthopaedic Department